What is claimed is

1. A method of forming a high-k dielectric film on a substrate comprising the steps of:

a) providing a hydrogen passivated surface on a semiconductor substrate within an atomic layer deposition chamber;

b) forming an interfacial layer by heating the substrate to a temperature below 200 degrees Celsius and introducing anhydrous hafnium nitrate into the chamber without introducing a hydrating gas, or an additional oxidizing gas, during the formation of the interfacial layer; and

c) forming a high-k film overlying the interfacial layer.

2. The method of claim 1, wherein the substrate has a silicon surface.

3. The method of claim 1, wherein the substrate is heated to a temperature in the range of approximately 30 to 200 °C during formation of the interfacial layer.

4. The method of claim 1, wherein forming the interfacial layer cycles anhydrous hafnium nitrate with a nitrogen purge.

5. The method of claim 1, wherein the step of forming a high-k film further comprises repeating the steps of: introducing a hafnium-containing precursor into the chamber, purging the chamber, introducing H_2O into the chamber, and purging the chamber until a desired film thickness is achieved.

6. The method of claim 5, wherein the hafnium-containing precursor is anhydrous hafnium nitrate, hafnium chloride, or hafnium$(tmhd)_x$.

7. The method of claim 1, wherein the step of forming a high-k film overlying the interfacial layer further comprises repeating the steps of: introducing a $HfCl_4$ precursor into the chamber, purging the chamber, introducing $Hf(NO_3)_4$ into the chamber, and purging the chamber until a desired film thickness is achieved.

8. The method of claim 1, wherein the step of forming a high-k film forms a high-k metal oxide film selected from the group consisting of ZrO_2, Gd_2O_3, La_2O_3, CeO_2, TiO_2, Y_2O_3, Ta_2O_5, Al_2O_3, $HfAlO_x$, $ZrAlO_x$, and $HfZrO_x$.

9. The method of claim 1, wherein the step of forming a high-k film forms a multilayer film comprising alternating layers of metal oxide films selected from the group consisting of ZrO_2, Gd_2O_3, La_2O_3, CeO_2, TiO_2, Y_2O_3, Ta_2O_5, Al_2O_3, $HfAlO_x$, $ZrAlO_x$, and $HfZrO_x$.

10. A method of forming a high-k dielectric film on a substrate comprising the steps of:

a) providing a hydrogen passivated surface on a semiconductor substrate within an atomic layer deposition chamber;

b) exposing the hydrogen passivated surface to a metal nitrate containing precursor at a temperature below the thermal decomposition temperature for the precursor without a hydrating gas, or an oxidizing gas, to produce self-limiting high-k interfacial layer; and

c) repeating the steps of exposing the surface to a metal-containing precursor, purging the chamber, exposing the surface to a hydrating gas, oxidizing gas, or precursor, and purging to deposit additional high-k material.

11. The method of claim 10, wherein the metal nitrate containing precursor has the formula $M(NO_3)_x$, where M is a metal selected from the group consisting of Hf, Zr, Gd, La, Ce, Ti, Y, Ta, and Al; and x is the valence of M.

12. The method of claim 10, wherein the additional high-k material is the same material as the interfacial layer.

13. The method of claim 10, wherein the additional high-k material is different than the interfacial layer.